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(54) Electrical sleeve terminal.

(57) An electrical sleeve terminal (10) of one-piece construction comprises a split sleeve (12) for engaging a mating terminal (P) and a crimp barrel (14) for attaching the terminal (10) to an electric cable (16). The split sleeve (12) has six circumferentially spaced beams (18) having contact dimples (26) in an alternatively staggered arrangement to biasingly engage the mating terminal (P) in two planes. The split sleeve (12) has flanges (22) at the respective edges of the split which are securely fastened together. The crimp barrel (14) is an integral extension of one flange (22) and a separate finger (32) which is an integral extension of the other flange (22) is fixed in the crimp barrel (14) to engage the conductor (31) of the electric cable (16).

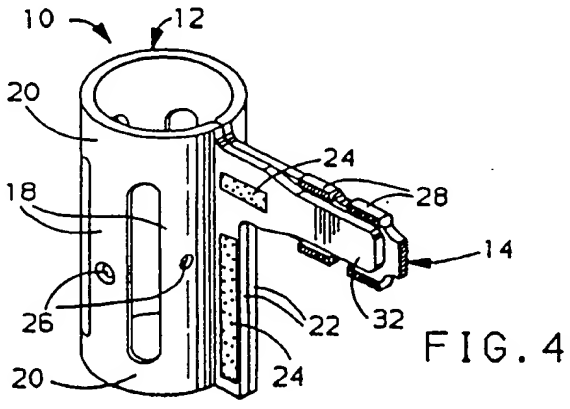

FIG. 4

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This invention relates to an electrical sleeve terminal, for example to an electrical sleeve terminal attached to an electric cable for use in high current automotive applications.

US-A-4,720,157 discloses an electrical sleeve terminal for high current automotive applications and designed for attachment to an electric cable. This prior art terminal is a complicated assembly of several pieces which is expensive to manufacture. Another drawback of this prior art construction is the presence of several electrical interfaces between the contact strips of the cylinder which engages the mating terminal and the crimp barrel attached to the electric cable. These electrical interfaces make it difficult to produce a reliable electrical connection which depends on the quality of the electrical contact at each interface.

The present invention seeks to provide an improved electrical sleeve terminal.

According to an aspect of the present invention, there is provided an electrical sleeve terminal as specified in claim 1.

The invention can provide an electrical sleeve terminal for use in high current automotive applications which is reliable and relatively inexpensive to manufacture.

The one-piece construction can minimize the electrical interfaces between the mating terminal and the electric cable.

In use, the electrical sleeve terminal may be easily mated and unmated with a rigid mating terminal, such as a solid pin.

Preferably, the electrical sleeve terminal includes a finger disposed in the conductor engaging area of the crimp barrel for improving current flow, heat dissipation and for eliminating need for a stock of different gauge terminals.

In an embodiment, the electrical sleeve terminal includes a split sleeve having elongated flanges at respective longitudinal edges of the split, securely fastened together so that the separate finger is fixed or immobile in a conductor engaging area of the crimp barrel.

Preferably, the electrical sleeve terminal includes elongated flanges which are flat so as to provide a mould seal surface so that the terminal can be used in a mould-over construction.

In a preferred embodiment, the electrical sleeve terminal includes a sleeve comprising a plurality of equally circumferentially spaced longitudinal beams having contact dimples which in use biasingly engage a mating terminal at several points around its perimeter when it is mated with the sleeve.

Preferably, the contact dimples are staggered, that is alternately located in longitudinally spaced planes to stabilize the electrical interface between the sleeve and the mating terminal.

Some embodiments of the present invention are described below, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a plan view of a sheet metal blank for making an embodiment of electrical sleeve terminal;

Figure 2 is a front view of an electrical sleeve terminal made from the blank of Figure 1;

Figure 3 is a plan view of the electrical sleeve terminal taken substantially along line 3-3 of Figure 2;

Figure 4 is a perspective view of the electrical sleeve terminal of Figures 2 and 3;

Figure 5 is a plan view of a sheet metal blank for making another embodiment of electrical sleeve terminal;

Figure 6 is a front view of a second electrical sleeve terminal made from the blank of Figure 5;

Figure 7 is a sectional view of the electrical sleeve terminal taken substantially along line 7-7 of Figure 6;

Figure 8 is a partial bottom view of the electrical sleeve terminal of Figure 6 taken substantially along line 8-8 of Figure 6;

Figure 9 is a perspective view of the electrical sleeve terminal of Figures 6, 7 and 8; and

Figure 10 is a partial bottom view of another embodiment of electrical sleeve terminal.

Referring to Figures 1 to 4, an electrical sleeve terminal 10 of one-piece construction is made from a suitable electrically conductive material, preferably a 3/4 hard Olin Alloy 151 ZHC Copper. This alloy, available from Olin Corporation of the Brass Group, has a nominal composition of 0.1% zirconium with the remainder copper. The composition limits are 0.05-0.15% zirconium; a maximum of 0.005% aluminium; a maximum of 0.005% manganese; a maximum of 0.005% iron, with the further restriction of a maximum of 0.01% aluminium, manganese and iron in total; and the remainder copper.

The electrical sleeve terminal 10 comprises a sleeve 12 for receiving a pin terminal P (shown in dashed outline in Figure 3) and a crimp barrel 14 for attaching the electrical sleeve terminal 10 to an electric cable 16.

The sleeve 12 is made from a slotted flat portion A of a sheet metal blank B shown in Figure 1 which is rolled into a split cylinder, as shown in Figures 2, 3 and 4. The rolled split sleeve 12 comprises a plurality of equally circumferentially spaced longitudinal beams 18, in this embodiment six, attached to upper and lower bands or rings 20. The sleeve 12 includes an elongated flange 22 at each longitudinal edge of the split formed when the flat portion A of the blank B is rolled into a cylinder. These elongated flanges 22 are securely fastened to each other, in this case by ultrasonic welds 24 in

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the flanges 22 and near portions of the crimp barrel 14.

Each beam 18 has a contact dimple 26 protruding radially inwardly of the sleeve 12, as best shown in Figure 3. The mating pin terminal P is chosen to be of a size such that these contact dimples 26 biasingly engage the pin terminal P at several points around its perimeter when it is inserted into the sleeve 12, primarily due to the resilience of the beams 18. The contact dimples 26 are preferably staggered as shown so that alternate contact dimples are located on two longitudinally spaced planes. Thus, three equally circumferentially spaced contact dimples 26 are located on an upper plane and three equally circumferentially spaced dimples 26 are located on a lower plane. This staggered arrangement stabilizes the interface between the sleeve 12 and the pin terminal P, particularly with regard to relative rocking movement between them.

The crimp barrel 14 is an integral extension of one of the flanges 22. It comprises conductor crimp wings 28 and insulation crimp wings 30 which are respectively crimped around the conductor 31 and insulation 33 of the electric cable 16. Besides the crimp barrel 14, the cable attachment means further includes a separate finger 32 which is an integral extension of the other of the flanges 22. The finger 32 lies against the internal surface of the trough joining the conductor crimp wings 28, that is the conductor engaging portion of the crimp barrel 14, as shown in Figures 2 and 4, so that the finger 32 abuts the conductor 31 when the crimp wings 32 are crimped around the conductor 31. The finger 32 is fixed in the conductor engaging portion of the crimp barrel 14 by means of ultrasonic welds 24 so that in the flanges 22 and portions of the crimp barrel 14 and finger 32 near the flanges 22, the finger 32 does not move when the sleeve terminal 10 is attached to the electric cable 16.

The finger 32 improves current flow and heat dissipation from the sleeve 12 to the conductor 31 of the electric cable 16. It also eliminates any need for polygauge stock to construct the sleeve terminal 10, primarily due to the second layer of material which the finger 32 provides in the conductor engaging portion of the crimp barrel 14. For instance, it has been found that an electrical sleeve terminal made of 0.51 mm (0.020 in) thick 3/4 hard Olin Alloy 151 ZHC Copper stock has a current carrying capacity of 200 amps or better.

The elongated flanges 22 are also preferably flat to provide mould seal surfaces when the electrical sleeve terminal 10 is used in a moulded-over construction to provide a sealed connector.

Referring to Figures 5 to 9, another embodiment of electrical sleeve terminal 100 is shown. This terminal is also of one-piece construction and made from a suitable electrically conductive material, preferably a 3/4 hard Olin Alloy 151 ZHC Copper as with the first described embodiment.

The electrical sleeve terminal 100 comprises a sleeve 112 for receiving a pin terminal P', shown in dotted outline in Figure 8, and a crimp barrel 114 for attaching the electrical sleeve terminal 100 to an electric cable 116.

The sleeve 112 is made from a slotted flat portion A' of a sheet metal blank B' shown in Figure 5 which is rolled into a split cylinder, as shown in Figures 6, 8 and 9. The rolled split sleeve 112 comprises a plurality of equally circumferentially spaced longitudinal beams 118, in this embodiment six, attached to upper and lower bands or rings 120. The sleeve 112 includes elongated flanges 122 at the respective longitudinal edges of the split which is formed when the flat portion A' of the blank B' is rolled into a cylinder. These elongated flanges 122 are securely fastened to each other by an interlocking lip 123 which is an integral extension of one of the flanges 122 and is wrapped or crimped over the edge of the other flange 122, as shown in Figures 6 and 9. The flanges 122 are secured by integral nesting interlocking buttons 124, shown in Figure 7 and described below.

Each beam 118 has a contact dimple 126 protruding inwardly of the sleeve 112, as best shown in Figure 8. The mating pin terminal P' is chosen to be of a size such that these contact dimples 126 biasingly abut the pin terminal P' at several points around its perimeter when it is inserted into the sleeve 112, primarily due to the resilience of the beams 118. The contact dimples 126 are preferably staggered as shown in Figures 5, 6, 8 and 9 so that alternate contact dimples are located on two longitudinally spaced planes, as explained above with respect to the first described embodiment.

The crimp barrel 114 is an integral extension of one of the flanges 122. It comprises conductor crimp wings 128 and insulation crimp wings 130 which are respectively crimped around the conductor 131 and insulation 133 of the electric cable 116. Besides the crimp barrel 114, the cable attachment means includes a separate finger 132 which is an integral extension of the other of the flanges 122. The finger 132 lies against the inner surface of the trough joining the conductor crimp wings 128 or conductor engaging portion of the crimp barrel 114, as shown in Figures 6 and 9, so as to abut the conductor 131 when the crimp wings 128 are crimped around the conductor 131. The finger 132 is fixed in the conductor engaging portion of the crimp barrel 114 by reason of the crimped-over interlocking lip 123 and the nesting interlocking buttons 124, so that the finger 132 does not move

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when the sleeve terminal 100 is attached to the electric cable 116.

The nesting buttons 124 integrally formed in the finger 132 and the crimp barrel 114 interlock as shown in Figure 7 so that the finger 132 and crimp barrel 114 are securely and immovably fixed to each other at this location. The nesting interlocking buttons 124 are located near the flanges 122 so that these buttons do not interfere with the conductor 131 being gripped by the conductor crimp wings 128.

The conductor engaging surface 134 of the finger 132 and the conductor engaging surface 136 of the crimp barrel 114 are knurled as shown in Figures 5, 6 and 9. When the finger 132 is folded against the bottom of the crimp barrel 114, it engages and partially covers the knurled conductor engaging surface 136, as shown in Figure 6. Engagement of the central portion of knurled surface 136 further enhances immobility of the finger 132 with respect to the conductor engaging portion of the crimp barrel 114. On the other hand, the exposed end portions of the knurled surface 136 and the knurled surface 134 of the finger 132 enhance conductivity between the conductor 131 and the crimp barrel 114 and between the conductor 131 and the finger 132 when the conductor 131 is gripped by the conductor crimp wings 128.

The finger 132 improves current flow and heat dissipation from the sleeve 112 to the conductor 131 of the electric cable 116 and eliminates any need for polygage stock to construct the sleeve terminal 100.

Figure 10 shows another embodiment of electrical sleeve terminal 200. The electrical sleeve terminal 200 is the same as the electrical sleeve terminal 100 except that the split sleeve 212 has dimples 226 protruding radially outwardly rather than inwardly. The electrical sleeve terminal 200 is adapted to engage a mating socket terminal P'', shown in dotted outline, rather than a mating pin terminal as with the embodiments of Figures 1 to 9. The contact dimples 226 are preferably staggered, as explained in connection with the contact dimples 26 and the contact dimples 126 of the embodiments of Figures 1 to 9. The outwardly projecting dimples 226 can also be used in the embodiment shown in Figures 1 to 4 where the flanges 22 are ultrasonically welded together.

The disclosures in United States patent application no 880,378, from which this application claims priority, and in the abstract accompanying this application are incorporated herein by reference.

Claims

1. An electrical sleeve terminal of one-piece construction including a sleeve (12) for receiving a mating terminal and a crimp barrel (14) for attaching the electrical sleeve terminal to an electrical cable (16); the sleeve comprising a plurality of spaced beams (18) extending in a longitudinal direction of the sleeve between first and second bands (20) at opposite ends of the sleeve, fist and second flanges (22) extending between first and second longitudinal edges of the sleeve, the first and second flanges being fastened together, each beam including a contact member (26) extending substantially perpendicularly to the longitudinal direction of the sleeve such that in use a mating terminal (P',P'',P''') is engaged by the contact members at a plurality of points around a perimeter of the mating terminal; the crimp barrel (14) being an integral extension of one of the first and second flanges.

2. An electrical sleeve terminal according to claim 1, wherein the contact members (26) comprise dimples, the dimples being staggered relative to one another such that dimples on alternate beams are located in longitudinally spaced planes so as in use to stabilize the connection between the sleeve and a mating terminal.

3. An electrical sleeve terminal according to claim 1 or 2, wherein the crimp barrel (14) comprises conductor crimp wings (28) adapted to be crimped around a conductor of an electric cable; the electrical sleeve terminal including a finger (32) extending integrally from the other of the first and second flanges (22) and being fixed in the crimp barrel so as in use to contact a conductor of an electric cable.

4. An electrical sleeve terminal according to claim 3, wherein the finger (32) is ultrasonically welded to the crimp barrel (14) at a location proximate the flanges (22).

5. An electrical sleeve terminal according to claim 3 or 4, wherein the finger (32) and the crimp barrel (14) are fastened together by interlocking buttons (124) located proximate the flanges.

6. An electrical sleeve terminal according to any preceding claim, wherein the flanges (22) are fastened together by ultrasonic welding.

7. An electrical sleeve terminal according to any one of claims 1 to 5, comprising interlocking

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means (123) for fastening the flanges (22) together.

8. An electrical sleeve terminal according to claim 7, wherein the interlocking means comprises an interlocking lip (123) on one of the first and second flanges crimped over the edge of the other of the first and second flanges.

9. An electrical sleeve terminal according to any preceding claim, wherein adjacent beams (18) are substantially equally spaced from one another.

10. An electrical sleeve terminal according to any preceding claim, wherein the flanges (22) are elongated and substantially flat to provide mould seal surfaces when the terminal is used in a moulded-over construction.

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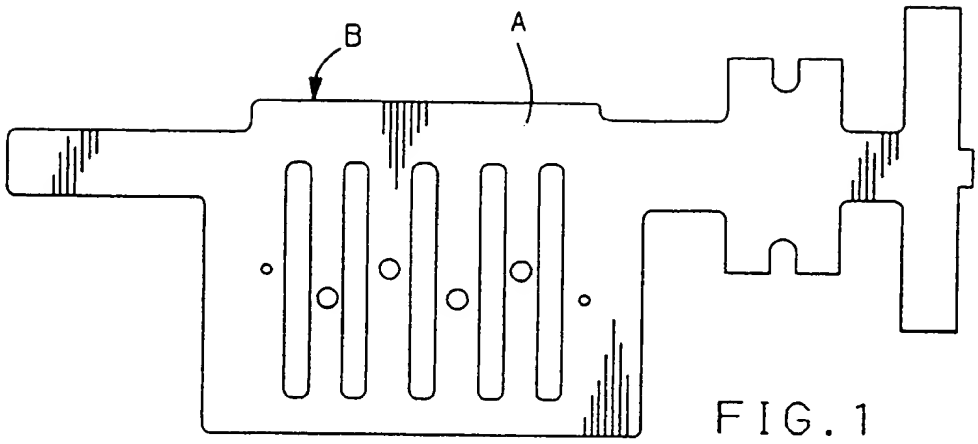

FIG. 1

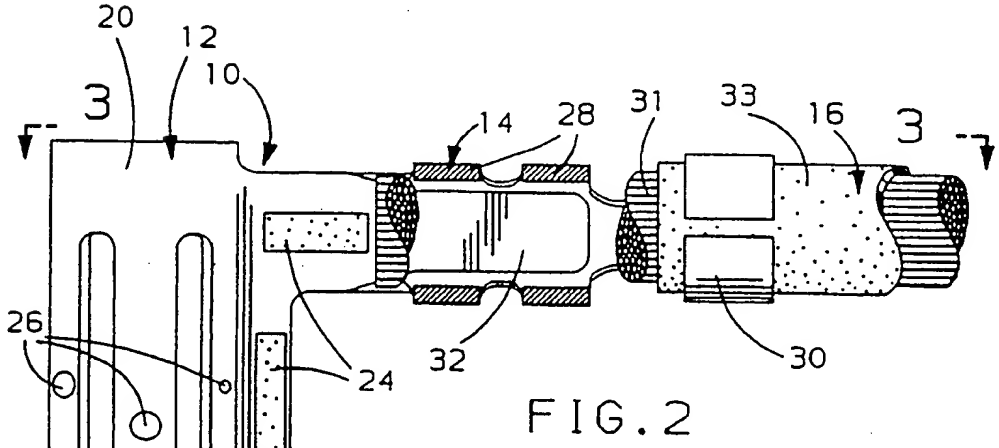

FIG. 2

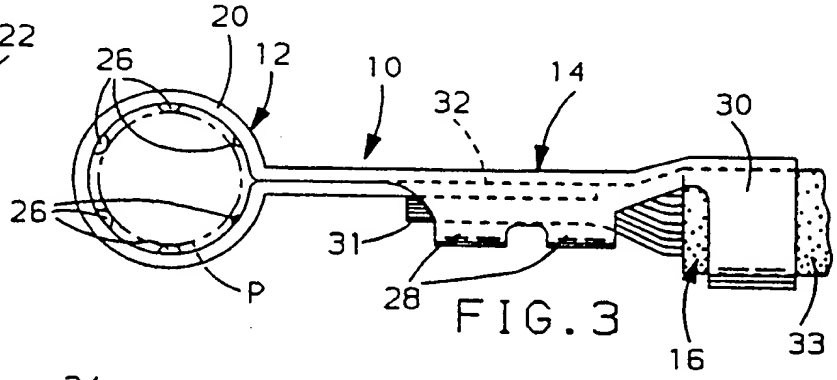

FIG. 3

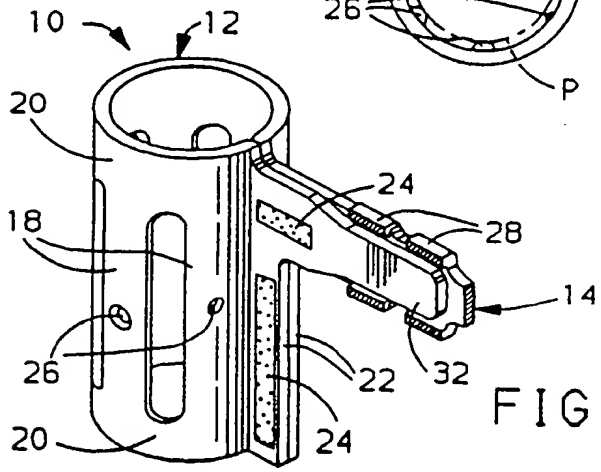

FIG. 4

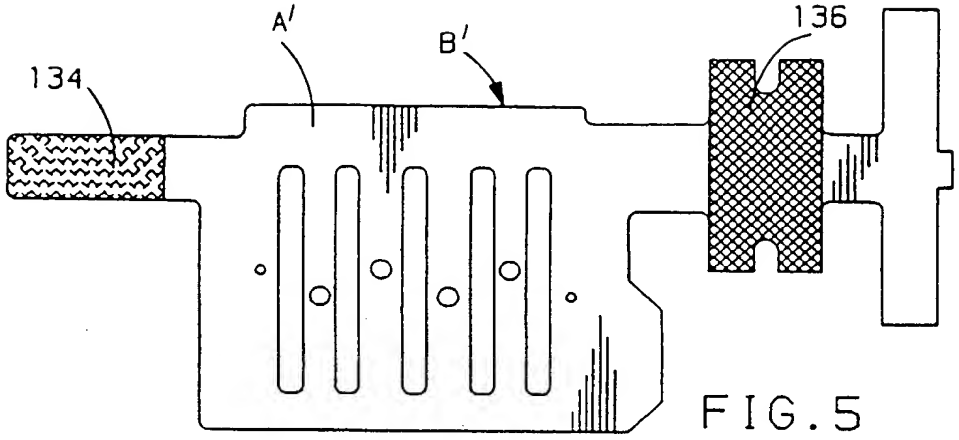

FIG.5

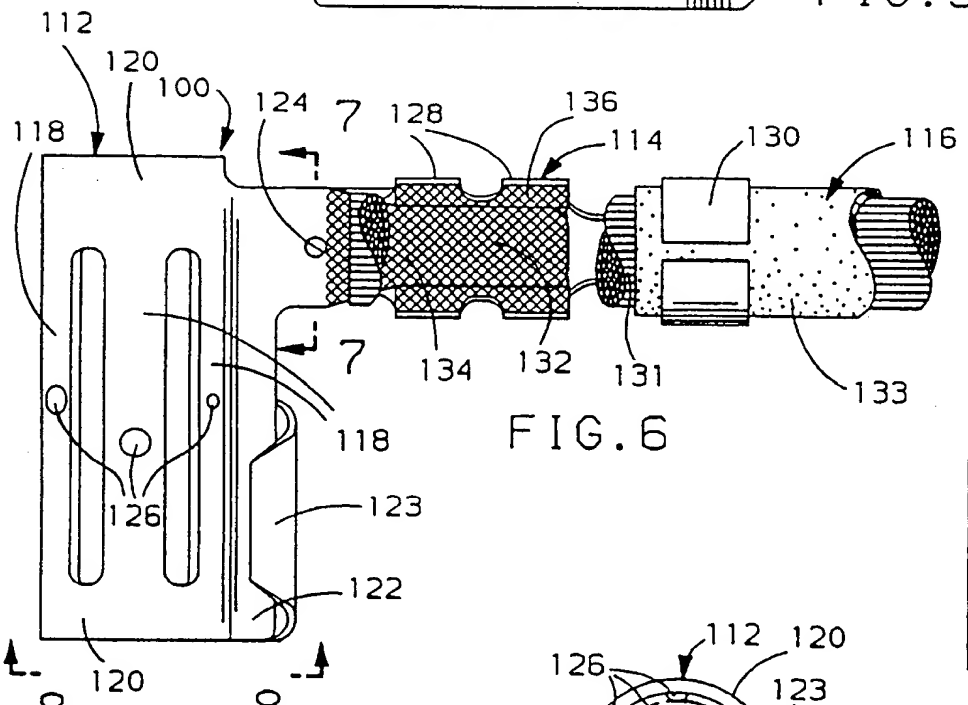

FIG.6

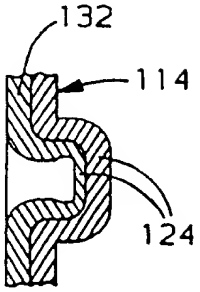

FIG.7

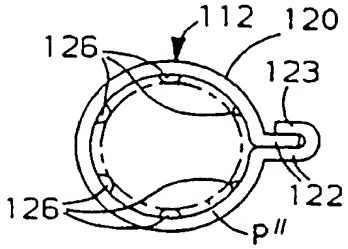

FIG.8

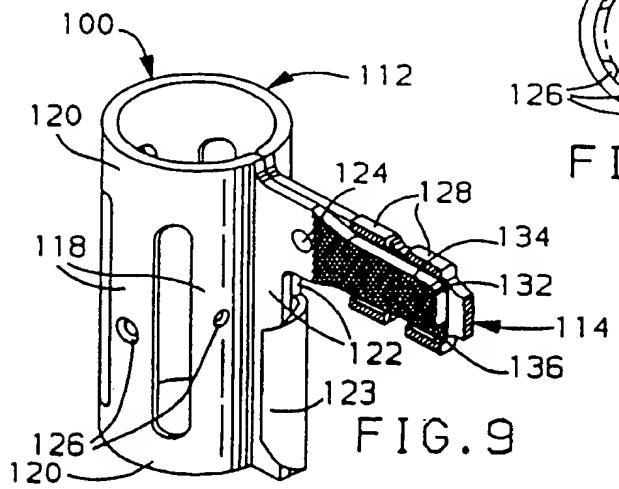

FIG.9

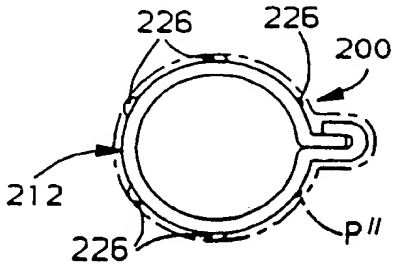

FIG.10

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 20 0889

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-2 613 141 (STOCKO-FRANCE) * page 2, line 31 - line 37 * * page 3, line 16 - line 28 * * page 4, line 31 - line 32; figures 1-4 *	1,2,7,9	H01R13/115
Y	WO-A-8 504 766 (AMP) * page 3, line 11 - line 26 * * page 4, line 3 - line 31; figures 1,6 *	1,2,7,9	
D,A	US-A-4 720 157 (C.R,NESTOR ET AL) * column 2, line 15 - line 25 * * column 4, line 1 - line 14; figures 7,8 *	1,3,9	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	17 AUGUST 1993	ALEXATOS G.

CATEGORY OF CITED DOCUMENTS

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